

The Incidence of Lower Mid-Trunk Hyperpigmentation (Linea Nigra) Is Affected by Sex Hormone Levels

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The incidence of linea nigra was studied in 1,550 Nigerians of both sexes and of different age groups and among pregnant women and men with benign and malignant prostatic diseases over a nine-month period.

From the study, it would appear that linea nigra increases in incidence from the age group 0–15 years (31.4%) to the age group 16–30 years (47.3%) before starting to fall in clinically normal individuals >30 years to 19.2%. For age groups 0–5 years, 6–10 years and 16–30 years, females more often than males have a linea nigra. For age group 11–15, males are equally as likely as females to have a linea nigra. The results suggest that women over 30 are more likely to have a linea nigra than men, but there are too few patients to make a definite statement, given the number of statistical tests performed. Pregnant women far more often have a linea nigra than nonpregnant women of the same age. The findings suggest that the likelihood of having a linea nigra depends on the level of sex hormones. This means that changes in the levels of hormones, either due to disease or drugs, may be reflected in changes in the incidence of a linea nigra. If this finding is confirmed, the linea nigra may serve as a convenient, noninvasive, free marker of alterations in sex hormones.

Key words: lower mid-trunk hyper pigmentation ■ linea nigra ■ Nigerian blacks

INTRODUCTION

The natural pigmentary demarcation boundaries of the skin have been classified as: group A—lines along the upper limbs with variable transpectoral extension; group B—lines along the lower limbs; group C—paired lines in median or paramedian course on the chest with midline abdominal extension; group D—posteromedian demarcation; and group E—bilaterally symmetrical, obliquely oriented hypopigmented macules on the chest. Groups A and C are the most distinct and occur in both Negroes and Japanese.¹

Cutaneous linea nigra and linea alba are two interesting skin markings in blacks. Other interesting (specific) pigmentary features in blacks related to the above classification include Mongolian spots along the spine on the back of prepubertal blacks and especially infants. Black infants also have localized areas of hyperpigmentation usually involving the helix of the ears, penis, scrotum and anal orifice. Postpubertal blacks frequently develop pigmented macules on the palms and soles of the feet.²

Linea alba is a midline hypopigmented line or band running from the dorsal aspect of the manubrium to the umbilicus. Linea nigra, on the other hand, usually extends from the umbilicus to the suprapubic area.

Why the upper half of the anterior trunk should have a hypopigmented ventral midline demarcation and the lower anterior trunk a hyperpigmented demarcation is not known. An advanced hypothesis is that melanocytes migrating from their neural crest origin do not always complete their journey. Examination of a total of 1,056 newborns delivered at Jackson Memorial Hospital (Miami, FL) for the presence of skin and oral lesions within 96 hours of birth to determine the frequency of dermatoses and other skin lesions found in normal newborns in South Florida revealed that the seven skin findings most frequently seen were Mongolian spots (72.5%), sebaceous hyperplasia (38.7%), salmon patch (34.6%), Epstein's

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pearls (33.0%), erythema toxicum neonatorum (26.9%), linea nigra (24.5%) and transient pustular melanosis (18.1%), respectively. Among these findings, Mongolian spots, sebaceous hyperplasia, salmon patch, erythema toxicum neonatorum, linea nigra and transient pustular melanosis were statistically significantly more frequent among blacks than among Caucasians.³

Linea nigra is an entity that many are not familiar with outside of pregnancy, when it assumes the name linea gravidarum. Over nine months, we studied groups of blacks (Nigerians) to find the incidence of linea nigra in both sexes and in different age groups and among pregnant women and among men with benign and malignant prostatic diseases.

SUBJECTS AND METHOD

The study was carried out between May 2003 and February 2004 and comprised 250 girls ages 0–15 years, 250 young women ages 16–30 years, 250 women ages 31 or more, 250 boys ages 0–15 years, 250 young men ages 16–30 years, and 250 young men ages 31 or more years. From the above group were culled 50 pregnant women ages 27–44, who were compared with a separate, additional group of 50 nonpregnant women ages 27–44.

Statistical Methods

For each sex, a Chi-squared statistic was calculated to test the notion that age group and presence of a linea nigra were unrelated. For each age group, a two-tailed Fisher's exact test was performed and an odds ratio calculated to test the notion that sex and the presence of a linea nigra were unrelated. The degrees of association were expressed as odds ratios. A two-tailed Fisher's exact test also evaluated the notion that two age-matched groups, 50 pregnant women and 50 nonpregnant women, would be equally likely to have a linea nigra. An odds ratio was also performed.

RESULTS

The results are partially summarized in Tables 1 and 2 and Figure 1. From the study, it would appear that the incidence of linea nigra increases from the age group 0–15 years (31.4%) to the age group 16–30 years (47.3%) before starting to fall in clinically normal individuals of both sexes and in nonpregnant females >30 years, to 19.2%. For both males and females, age groups differ in regards to the likelihood of having a linea nigra. For age groups 0–5 years, 6–10 years and 16–30 years, females more often than males have a linea nigra. For age group 11–15, males are equally as likely as females to have a linea nigra. The results suggest women over 30 more likely to have a linea nigra than men, but there are too few patients to make a definite statement, given the number of statistical tests performed. Pregnant women far more often have a linea nigra than nonpregnant women of the same age. The incidence of linea nigra in pregnant females ages 27–44 years was 92.0%, while it fell to 16.0% in nonpregnant females of the same age group. The duration of pregnancy in the pregnant females who had no linea nigra was between 18 weeks three days and 26 weeks two days (early pregnancy).

DISCUSSION

The documentation of linea nigra is not a new entity; however, data on the entity is rare in peer-reviewed journals. Only a few standard text books mention it, especially regarding its occurrence in males. Furthermore, the few reports have been in African Americans. It assumes the name "linea gravidarum" in pregnancy. We studied the entity in Nigerian blacks, where there hasn't been racial admixture as in American blacks. The study looked at the incidence of linea nigra in various age groupings and genders and its presence in some clinical situations. From the study (Tables 1 and 2), it would appear that hormonal influences are related to linea nigra considering the increase in incidence of linea nigra with increasing age in children, the striking difference in incidence in the pregnant and nonpregnant states (very high in the former) and the rise in incidence in prostatic enlargement where there could be some modification of the prostatic epithelium. Regarding the latter, a study⁴ hypothesized that malignant transformation of human prostatic epithelium is associated with the loss of androgen-receptor immunoreactivity in the surrounding stroma. In an earlier study in University College Hospital, Ibadan,⁵ the

Table 1. Frequency Distribution of Patients by Presence of Linea Nigra, Age Group and Sex

Age (years)	Females		Males		Odds Ratio	P
	Linea Nigra Present	Linea Nigra Absent	Linea Nigra Present	Linea Nigra Absent		
1–5	23	55	5	72	6.02	0.0003
6–10	37	52	14	63	3.20	0.0013
11–15	41	42	38	58	1.49	0.2275
16–30	213	37	24	226	54.21	<0.0001
30 and above	18	232	7	243	2.69	0.0253
Chi-square (4 df)	317.06		97.39			
P	<0.0001		<0.0001			

Displayed are the calculated odds ratio and P values, for each age group, that compare females with males. Also displayed are the calculated Chi-squared and P values, for each sex, that compare the age groups with one another.

incidence of linea nigra in men with advanced liver cirrhosis (Olweny's clinical staging) was low, indicating additional factors in the local environment in addition to a relatively high estrogen level. Melasma has been found occasionally in males on drugs, such as thiazide antidiuretics (undocumented observation), being used for the management of hypertension and often without obvious causes.⁶ Accumulation of chemicals/drugs in obstructive uropathy as may be seen in benign prostatic hyperplasia (BPH) and prostatic cancer could be an additional mechanism by which the melanocytes of the linea alba could get stimulated.

Hormonal changes associated with puberty would most likely explain the peak incidence of linea nigra at age group 11–15 years. Since some individuals of both sexes fail to have this pigmentation, there is likely to be varying responsiveness by the population of cutaneous melanocytes in the midline of the abdomen to various hormones/chemicals based possibly on genetic, gender and age and some clinical or physiological situations. Linea nigra appears to be best known in both Caucasians and blacks during pregnancy, when it assumes the name linea gravidarum. The widespread pigmentation that occurs during this stage of life—on the face (melasma/chloasma), the areola of the breasts and nipples, and scars and naevi—has been attributed to the effect of estrogen levels.^{6,7} Progesterone and melanocyte-stimulating hormone have also been considered to have a possible role.⁸

In a prospective European study⁹ of 60 pregnant women (nonpathologic pregnancy), 45 had linea nigra. In our study, four of 50 (8%) healthy pregnant Nigerians aged 27–44 years did not have linea nigra. This suggests that there possibly are other cofactors responsible for causing pigmentation in the melanocytes of the linea alba or that there may be variation in responsiveness by the melanocytes. It has also been documented that some may not have linea nigra at the early stage of pregnancy, introducing time factor/stage, trimester of pregnancy.

To clarify further the mechanism/chemicals responsible for the incidence of linea nigra, it may be informative to study a population of males on drugs with antiandrogen property, such as Cimetidine (for peptic

Figure 1. Percent of patients with linea nigra by age and sex.

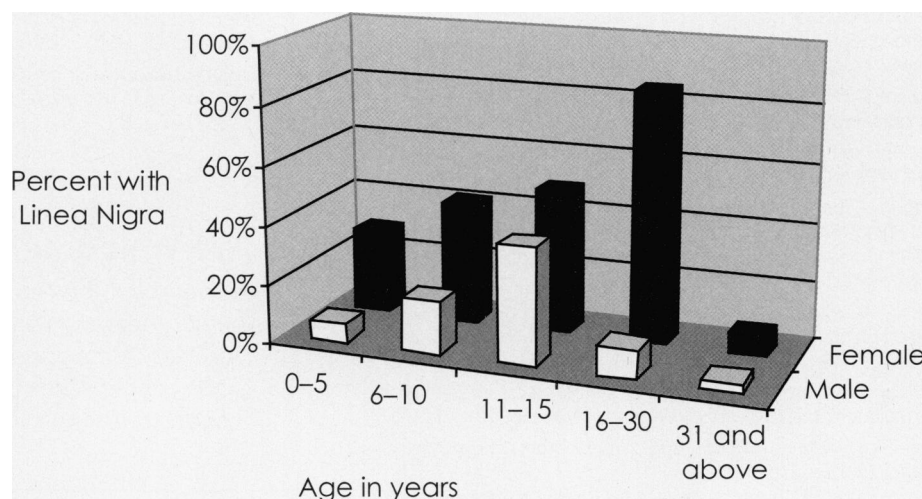


Table 2. Frequency Distribution of Patients by Pregnancy Status and Presence of Linea Nigra, the Calculated Odds Ratio and P Values

	Linea Nigra	
	Yes	No
Pregnant		
Yes	46	4
No	8	42
Odds ratio	60.38	
P	<0.0001	

ulcer diseases), spironolactone (for cardiac failure or liver cirrhosis), and patients with prostate cancer who are on drugs that effect maximum androgen blockade, and to compare the incidence of linea nigra in males with acne keloidalis—an entity in which there is some suggestion of testosterone involvement¹⁰ with patients without acne keloidalis.

The inference from this study is that the midline structure linea alba can become hyperpigmented in both males and females and in all age groups, even in newborn black babies. It would appear that in both genders the incidence increases significantly to a high level by age 15 years and thereafter declines, except during some physiological situations like pregnancy. Not every pregnant woman has linea nigra (referred to as linea gravidarum during this phase of life). Linea nigra may disappear after pregnancy, causing a reduction in the incidence of linea nigra in nonpregnant, older females. Because the presence or absence of linea nigra is so easily ascertained, if the findings of this study are confirmed, the linea nigra can and should be used as a marker for alterations in the level of sex hormones. Age- and sex-matched groups could

be compared for any disease or therapy using this readily assessed physical sign.

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